UNIVERSITI TEKNOLOGI MARA

BEHAVIOUR OF PROFILED WEB TAPERED GIRDERS UNDER STATIC SHEAR LOADING

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ABSTRACT

Economical and efficient design of steel girders normally requires thin webs. Adequate out of plane stiffness and shear buckling resistance without using transverse intermediate stiffeners or using a thick material can be achieved by using profiled webs. Since the advent of steel structures, it has been desired to reduce the weight and cost of the component parts. With the advance of welding technology, the use of thin profiled webs has been widely used in recent years. The focus of this study is to investigate the behaviour of tapered plate girders with trapezoidally profiled webs under static shear loading. This study involves numerical analysis using the finite element software package, LUSAS to execute linear and nonlinear analysis. The numerical study includes the development of non- linear simulation and geometry of finite element models. The entire plate components such as flanges, web and stiffeners were modelled by using eight- noded quadrilateral thin shell elements. Each specimen was run under a static shear load placed on the top flange. Series of eigenvalue buckling analysis were performed to obtain the critical buckling loads of tapered girder models and respective buckling modes were identified and investigated. The results are compared with previous experimental results. Parametric studies which involve various geometries of tapered panels were done in order to find the most optimum design situations. The results from the finite element analysis are presented and discussed. The ultimate shear load capacities of different types of geometric and their buckling modes are discovered. The shear capacities of girders with profiled webs are increased 21.8% - 36.3% higher compare to the girders with flat webs. The buckling modes that occurred in this study are local and global buckling mode. The typical failure mode of a tapered girder with profiled web is initially in the local buckling mode. The buckling phenomenon starts from local buckling mode in the early stage normally after the load reaches its peak and then transformed to global buckling mode at failure load. The buckling starts locally in the flat part of web sub- panel and then propagates to another sub- panel which is then in the global buckling mode. From the results, this study shows that different geometric parameters influence the strength of the profiled tapered plate girders.

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